Optimizing Pregnancy Management in the Context of Undifferentiated Brachial Plexus Injury

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Abstract

Brachial plexus injury (BPI) during pregnancy is a rare but significant obstetric complication that can lead to long-term morbidity for both the mother and the infant. The brachial plexus, a network of nerves originating from the spinal cord, controls the muscles of the shoulder, arm, and hand. The earliest written description of a brachial plexus injury is attributed to Homer circa 800 BC in *The Iliad*, where Hector strikes Teucer over the clavicle with a rock, rendering him incapable of wielding his bow [2]. Anatomically, the brachial plexus comprises five nerve roots (C5–T1) and occasionally receives contributions from C4 and T2 [3]. Injury to this plexus can result in varying degrees of paralysis and sensory loss. This article aims to explore the pathophysiology, risk factors, diagnostic approaches, and management strategies for BPI in pregnancy, with a focus on optimizing outcomes.

Introduction

Brachial plexus injury (BPI) is a rare but serious complication that can occur during pregnancy and childbirth. While it is commonly linked to traumatic deliveries, it may also occur without overt risk factors [9]. Understanding the pathophysiology, risk factors, diagnostic approaches, and management strategies for BPI in pregnancy is crucial for improving maternal and neonatal outcomes [4], [6].

Pathophysiology of Brachial Plexus Injury

BPI typically results from excessive traction or compression of the brachial plexus during delivery. Types of BPI include:

- **Erb's Palsy (C5–C6)** – Weakness in shoulder abduction and external rotation
- **Klumpke's Palsy (C8–T1)** – Affects hand and wrist function
- **Total Plexus Palsy (C5–T1)** – Involves entire limb, leading to full paralysis [3], [7]

The severity ranges from neurapraxia (transient injury) to neurotmesis (complete nerve disruption), with the latter requiring surgical intervention [6], [13].

Risk Factors and Aetiology

Common maternal and obstetric risk factors include:

- **Shoulder Dystocia** – A leading cause of BPI during delivery [1], [11]
- **Macrosomia** – Infants >4000g present elevated risk [8]
- **Maternal Diabetes and Obesity** – These metabolic disorders increase the likelihood of fetal overgrowth and delivery complications [5]
- **Prolonged Labor/Operative Deliveries** – Use of forceps or vacuum can contribute to BPI [10]

However, BPI may occur even in the absence of shoulder dystocia due to intrauterine positioning or spontaneous delivery mechanisms [12].

Diagnostic Approaches

Early and accurate diagnosis of BPI is essential. The standard diagnostic tools include:

- **Clinical Examination** – Reflexes, muscle tone, and limb movement [9]
- **Electromyography (EMG)** – Evaluates nerve conduction [14]
- **MRI** – Detects structural damage or avulsion [13]
- **Ultrasound** – Can assess fetal positioning antenatally

Combining these modalities helps clinicians determine the extent of the injury and plan interventions effectively [8].

Management Strategies

Effective management requires a multidisciplinary approach involving obstetricians, neurologists, and pediatric surgeons:

- **Prenatal Counseling** – For mothers with known risk factors [5]
- **Planned Cesarean Delivery** – When shoulder dystocia is anticipated [1]
- **Postnatal Physical Therapy** – Crucial for functional recovery [7]
- **Surgical Intervention** – Such as neurotization or nerve grafting for severe or persistent injuries [6], [15]

Early intervention significantly enhances functional outcomes in infants with BPI [13].

Prognosis

Prognosis depends on the type and extent of nerve damage:

- **Neurapraxia** – Usually resolves within weeks to months [9]
- **Axonotmesis** – Partial recovery expected over time
- **Neurotmesis** – Often requires surgical repair, with varying outcomes [14]

Long-term disabilities can include limb deformities or motor deficits if not promptly treated [12].

Conclusion

BPI during pregnancy remains a complex and potentially debilitating condition. Understanding the anatomy, risk factors, and management options is essential. With early diagnosis, careful delivery planning, and appropriate postnatal interventions, many cases of BPI can result in favorable outcomes [10], [13], [15].

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